

Sorex dispar and *Sorex gaspensis*. By Gordon L. Kirkland, Jr.

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Sorex dispar Batchelder, 1896

Rock or Long-tailed Shrew

Sorex macrurus Batchelder, 1896:133. Type locality Beedes (sometimes called Keene Heights), Essex Co., New York, U.S.A. (not *S. macrurus* Lehmann, 1822).

Sorex dispar Batchelder, 1911:97. Renaming of *S. macrurus* Batchelder.

Sorex gaspensis Anthony and Goodwin, 1924

Gaspé Shrew

Sorex gaspensis Anthony and Goodwin, 1924:109. Type locality Mt. Albert, 2,000 ft., Gaspé Peninsula, Quebec, Canada.

CONTENT AND CONTEXT. Order Insectivora, Superfamily Soricoidea, Family Soricidae, Subfamily Soricinae, Tribe Soricini (Repenning, 1967). Genus *Sorex*, Subgenus *Otisorex* (Kirkland and Van Deusen, 1979). The genus *Sorex*, which contains 40 to 50 species, is found throughout the Holarctic. *Sorex dispar* and *S. gaspensis* are allopecies comprising the *S. dispar* group. Two subspecies of *S. dispar* are currently recognized:

S. d. dispar Batchelder, 1896:133.

S. d. blitchi Schwartz, 1956:26. Type locality 2 mi NE Wagon Gap, 4525 ft., Haywood Co., North Carolina, U.S.A.

Sorex gaspensis is monotypic (Kirkland and Van Deusen, 1979).

DIAGNOSIS. *Sorex dispar* and *S. gaspensis* are small, slender, slate-gray, long-tailed shrews. The skulls of both species are delicately constructed, smooth, non-angular, narrow, and moderately flattened (Figs. 1 and 2). The ridge extending from the apex to the cingulum of the unicuspid characteristic of the subgenus *Otisorex* is present in both shrews of the *Sorex dispar* group; however, pigmentation of the ridge is usually faint and often lacking. The rostra are long, narrow and depressed (Jackson, 1928). The two species are distinguished primarily on the basis of size, *S. dispar* being larger in nearly every external and cranial character (Kirkland and Van Deusen, 1979) (Figs. 2 and 3). *S. gaspensis* has paler and more grayish pelage, weaker dentition, and slightly larger hindfoot in proportion to total length (Jackson, 1928). There is no overlap between these species in condylobasal length and length of the molariform tooth row. In *S. dispar*, condylobasal length is >16.4 mm; molariform tooth row is >3.7 mm. In *S. gaspensis*, condylobasal length is <16.4 mm; molariform tooth row is <3.7 mm (Kirkland and Van Deusen, 1979).

The skulls of *S. dispar* and *S. gaspensis* can be distinguished from those of other North American *Sorex* on the basis of the position of the posterior border of the infraorbital foramen which lies posterior to the plane between M1 and M2 in these species. Their rostra are longer than those of other *Otisorex*. Externally the slate-gray dorsal pelages and longer tails of *S. dispar* and *S. gaspensis* serve to distinguish them from all other sympatric soricids save the smoky shrew (*Sorex fumeus*). The dorsal pelages of *S. dispar* and *S. gaspensis* are slate-gray throughout the year, whereas that of *S. fumeus* changes from brown in summer to slate-gray in winter, at which time the pelage is virtually indistinguishable from those of *S. dispar* and *S. gaspensis*; however relative tail length in *S. dispar* and *S. gaspensis* averages 80 to 90% of head-body length versus only 60 to 70% in *S. fumeus*. *S. dispar* and *S. gaspensis* are also distinguished from *S. fumeus* by their more slender and delicately constructed rostra and their more slender builds with consequently lower body weights; *S. fumeus* is considerably larger than *S. gaspensis*.

GENERAL CHARACTERISTICS. Both species are small, slender, long-tailed shrews with *S. dispar* conspicuously larger in nearly every character. *S. dispar* weighs 3.1 to 8.3 g;

weights of 2.2 to 4.3 g have been recorded for *S. gaspensis*. Total and tail lengths (mm) for *S. dispar* average $119.5 \pm \text{SD } 6.6$ (103 to 136, $n = 218$) and $56.3 \pm \text{SD } 3.0$ (46 to 67, $n = 219$), respectively. For *S. gaspensis*, these measurements are 105.0 ± 8.8 (95 to 127, $n = 21$) and 49.7 ± 2.6 (45 to 55, $n = 23$). Condylobasal length in *S. dispar* averages $17.34 \text{ mm} \pm 0.47$ (16.45 to 18.70, $n = 122$) versus $15.88 \text{ mm} \pm 0.37$ (15.35 to 16.35, $n = 18$) in *S. gaspensis*. In *S. dispar*, the molariform tooth row averages $4.01 \text{ mm} \pm 0.12$ (3.75 to 4.30, $n = 154$); it averages $3.56 \text{ mm} \pm 0.07$ (3.40 to 3.65, $n = 18$) in *S. gaspensis*. Statistical comparisons of the two species for these and 17 other measurements reveal highly significant statistical differences ($P < .001$) in all but ear length; *S. dispar* is larger in all cases (Kirkland and Van Deusen, 1979).

Summer pelage in *S. dispar* is slate-gray (mouse gray to deep mouse gray of Ridgway, 1912) with a perceptible tinge of chaetura black or chaetura drab (Jackson, 1928). Dorsal pelage in *S. gaspensis* is also slate-gray (dark mouse gray) faintly ticked with whitish (Anthony and Goodwin, 1924) giving it a slightly paler dorsal coloration than *S. dispar*. Both species are virtually concolor with the venter scarcely lighter than the dorsum. The tail

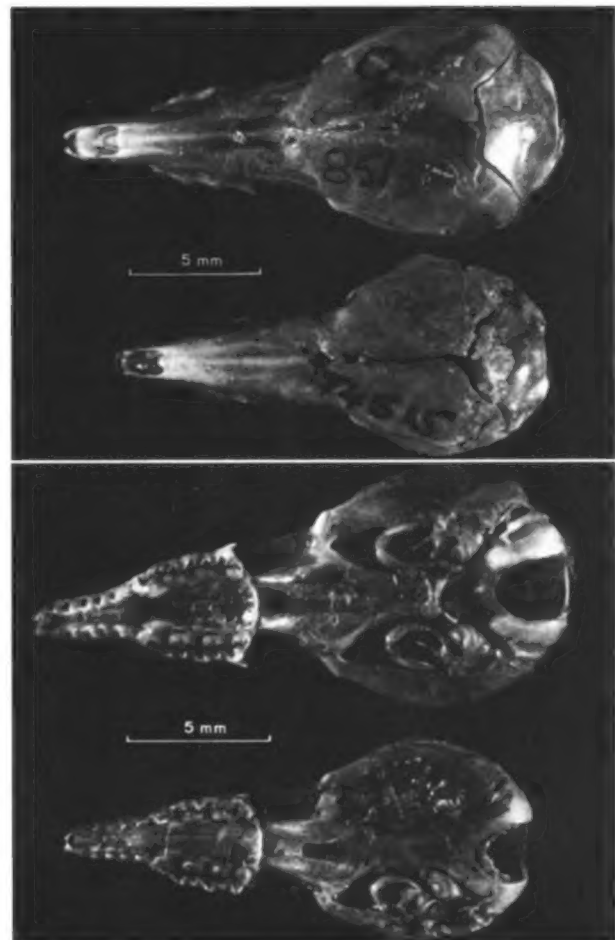


FIGURE 1. Dorsal and ventral views of crania of *Sorex dispar* (SSC 8515, female from N.Y., Essex Co., 1.7 mi SE St. Huberts, alt. 1500 ft.) and *S. gaspensis* (AMNH 74515, female from Cascadepia Red Camp, Gaspé Peninsula, Quebec). Photo by Robert G. Abram.



FIGURE 2. Lateral views of crania and left rami of mandibles of same specimens shown in Fig. 1. Photo by Robert G. Abram.

of each is well furred and not distinctly bicolored. Like other *Sorex*, older *S. dispar* exhibit a loss of hair from the tail which becomes naked and somewhat club-like.

DISTRIBUTION. Both species are limited in geographic distribution to the mountainous regions of eastern North America (Fig. 4). The range of *S. gaspensis* as now known is disjunct, consisting of three subranges: the Gaspé Peninsula of Quebec, northern New Brunswick, and Cape Breton Island, Nova Scotia. *S. dispar* occurs in a narrow belt extending from Maine to North Carolina, plus a disjunct population recently discovered in southeastern New Brunswick (Kirkland et al., 1979). The boundary between the two subspecies of *S. dispar* lies in the vicinity of the Pennsylvania, Maryland, West Virginia borders (Fig. 4), *S. d. dispar* occurring to the north and *S. d. blitchi* to the south (Kirkland and Van Deusen, 1979). The two shrews of the *S. dispar* group are the only boreal small mammals of eastern North America whose ranges lie completely south of the St. Lawrence River, and *S. gaspensis* is the only mammal species restricted in distribution to Dice's (1938) Canadian Biotic Province.

FOSSIL RECORD. The Rock Shrew is known from Pleistocene cave deposits in Pennsylvania (Guilday, 1971; Guilday et al., 1964), Virginia (Guilday et al., 1977) and Tennessee (Guilday et al., 1978). These records confirm that *S. dispar* occupied southern Appalachian refugia during the Wisconsin glacial advance. In all cases, remains of *S. dispar* constitute only a small percentage (generally <7%) of the fossil *Sorex*, suggesting that *S. dispar* was probably no more abundant in the Pleistocene than at present.

There are no published records of any fossil remains for *S. gaspensis*. However, Guilday (pers. comm.) has recently identified *S. gaspensis* from subfossil remains (up to 4,000 yrs. B.P.) removed from Caverne de St. Elzéar de Bonaventure, Gaspé Peninsula, Quebec. As is the case with *S. dispar* in southern Appalachian cave deposits, *S. gaspensis* at Caverne de St. Elzéar are not common, constituting only 13 of a total of 1,017 *Sorex* identified to date.

FORM AND FUNCTION. The two shrews of the *S. dispar* group exhibit several adaptations which may serve to reduce competition with other syntopic soricids and to facilitate navigation of their subterranean rocky habitats. The skulls of both



FIGURE 3. Skins of *Sorex dispar* (SSC 4216) and *S. gaspensis* (AMNH 74513). External measurements (total length, tail length, length of hindfoot) of *gaspensis* are 105-50-12.5 mm; equivalent measurements for *dispar* are shown on tag. Photo by Robert G. Abram.

are characterized by slender rostra and procumbent incisors. Kirkland and Van Deusen (1979) proposed that these two adaptations permit both species to exploit food resources in the narrower crevices in the rocks. The long tails of these two shrews (80 to 90% of head-body length) may serve as balancing aids in climbing about their rocky habitats. Their slender bodies may permit them to navigate more completely the smaller interstices of their subterranean environments.

S. dispar evinces a latitudinal cline for size with extremities becoming shorter and body size decreasing with increasing latitude. Mezhzhherin (1964) has documented the presence of similar latitudinal clines among Eurasian *Sorex* in which the smallest representatives are from the northernmost regions having the lowest winter temperatures. In an analysis of 22 characters for 224 *S. dispar* from latitudes 35.6–45.9°N, Kirkland and Van Deusen (1979) found that 21 were significantly negatively correlated ($P < .02$) with the latitude (nearest 0.1°) of the capture site. If the cline for *S. dispar* is projected to the latitude of *S. gaspensis* (0.5–3.1° farther north), it does not approximate the size of *S. gaspensis* but predicts significantly larger shrews. This suggests

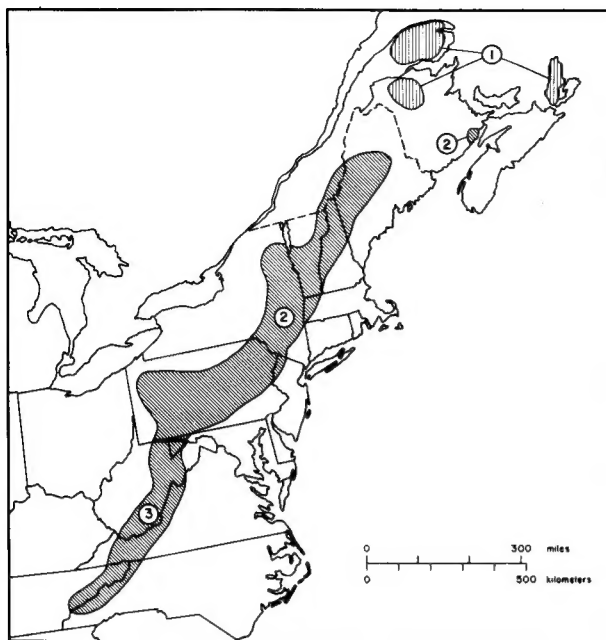


FIGURE 4. Geographic distribution of *Sorex gaspensis* (1), *S. dispar dispar* (2), and *S. d. blitchi* (3). Map drawn by Tyrone R. Cornbower.

that *S. gaspensis* does not represent a disjunct northern extension of the cline observed for *S. dispar*.

ONTOGENY AND REPRODUCTION. Reproductive data on these two shrews are scanty. Only four pregnant *S. dispar* have been collected. Two Pennsylvania specimens each carried five embryos (Richmond and Grimm, 1950); each of two specimens from Essex Co., New York, had two embryos (Kirkland and Van Deusen, 1979; Tate, 1935). There are no records of any pregnant *S. gaspensis*. In *S. dispar*, the reproductive season appears to extend from early spring to late summer. Reproductively active males have been taken from April through August; pregnant or lactating females have been collected from May through August (Kirkland and Van Deusen, 1979).

ECOLOGY. *S. dispar* is stenotopic, primarily inhabiting two types of sites: under and among rocks, particularly in talus slopes, and adjacent to cool mountain streams. The holotype was captured in a cool, moist, shaded area "among angular boulders at the head of a wooded talus" (Batchelder, 1896). Subsequent descriptions of the habitat of this species have emphasized the importance of rocks as a principal habitat component, thus giving rise to the common name "rock shrew" (Davis, 1956; Green, 1930; Handley, 1956; Holloway, 1957; Jackson, 1928; Richmond and Grimm, 1950; Starrett, 1954). Usually these capture sites are wooded, the rocks being cool, moist and moss-covered. Less often, rock shrews are captured in traps set along the edge of small mountain streams (Kirkland and Van Deusen, 1979; Lincoln, 1935; Mansueti and Flyger, 1952; Mather, 1933; Osgood, 1935). This habitat is typical of the water shrew (*S. palustris*) and both species have been trapped in the same traplines on numerous occasions.

Sorex dispar is not restricted to natural talus. Conaway and Pfitzer (1952) captured it in artificial talus created by road building in the Great Smoky Mountains. A permanent population of *S. dispar* inhabits man-made granitic talus from an open-pit mine in Essex Co., New York (Kirkland, unpublished data). In addition, Kirkland et al. (1976) and Stormer (1968) have trapped *S. dispar* on recent clearcuts in West Virginia and Pennsylvania, respectively.

Although not as thoroughly documented, the habitat preferences of *S. gaspensis* appear to be similar to those of *S. dispar*. Specimens initially collected on the Gaspé Peninsula were trapped at the edge of small streams, frequently in association with *S. palustris* (Anthony and Goodwin, 1924). The only specimen known from New Brunswick was taken along a small tributary stream on the slopes of Mt. Carleton (Peterson and Symansky, 1963). *S. gaspensis* recently collected on Cape Breton

Island, Nova Scotia, have been trapped in rocky mixed deciduous forests (Roscoe and Majka, 1976; F. Scott, Nova Scotia Museum, pers. comm.).

The two shrews of the *S. dispar* group have predominantly boreal distributions and habitat preferences. As a consequence, both species are consistently captured in association with several other small mammals with boreal affinities. These include *Sorex cinereus*, *S. fumeus*, *S. palustris*, long-tailed *Peromyscus maniculatus*, *Clethrionomys gapperi*, *Microtus chrotorrhinus* and *Napaeozapus insignis*. In addition, *S. gaspensis* has been captured in conjunction with *Sorex (Microsorex) hoyi* in Quebec (Goodwin, 1924, 1929), New Brunswick (Peterson and Symansky, 1963) and Nova Scotia (Roscoe and Majka, 1976). *S. dispar* has been found together with *Microsorex* in late Pleistocene cave deposits in Pennsylvania (Guilday et al., 1964; Guilday, 1971), Virginia (Guilday et al., 1977) and Tennessee (Guilday et al., 1978). At these sites, in addition to those species previously mentioned, associated species have included several other boreal small mammals whose ranges are presently disjunct from that of *S. dispar* (e.g., *Phenacomys intermedius*, *Microtus xanthognathus* and *Dicrostonyx hudsonius*).

Although the food habits of these two shrews are poorly known, both appear to feed primarily on small invertebrates. In Pennsylvania, Richmond and Grimm (1950) identified centipedes as the primary constituent in the stomachs of *S. dispar*; spiders and insects were present in lesser amounts. The stomachs of six *S. dispar* from the Great Smoky Mountains contained chiefly insects, including Coleoptera, in addition to Arachnida (Conaway and Pfitzer, 1952). Adult diptera, spiders and Orthoptera were the principal food items in the stomachs of six New York *S. dispar* (Connor, 1960). In the only published analysis of the stomach contents of *S. gaspensis*, Hamilton and Hamilton (1954) reported beetles and spiders as the principal components in the stomachs of two specimens.

REMARKS. The type locality of *S. dispar* has been subject to some debate because of its ambiguity [sometimes called Keene Heights], in the township of Keene, Essex Co., New York) and changes in local geographic nomenclature. Martin (1966) has clarified this situation by redescribing the type locality as follows: 0.6 mi S, 0.5 mi E St. Huberts, Essex Co., New York, lat. 44°09', long. 73°46'.

Sorex dispar has had a variety of common names, including rock shrew, long-tailed shrew, big-tailed shrew, gray long-tailed shrew, and longtail shrew. Two common names, long-tailed shrew and rock shrew, are currently accepted (Jones et al., 1979).

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